Euler's theorem: motion on the surface of a globe is described by the pole of rotation. If the pole and rate of angular rotation is known, the relative velocities of any points can be determined.

GEOMETRIC
First continent fits: used coastlines - not so good.
Switch to 500 fathom (920m) contour (Bullard 1965)
some parts of plates overlap or gaps are left - some of these problems can be explained by new rock (e.g. iceland/niger delta) or destruction of crust since pangea breakup.

LITHOLOGIC
problem - old belts often rift, so things don't cross them. some mountain belts can be matched up. Correlations of sedimentary rocks with source terranes. pinning igneous intrusions/extrusions.

PALEOCLIMATE
Reefs/marine carbonates indicate low latitude (water 25-30°)
Evaporites - high temp, intermittent wetting - coastal
Red beds - high dehydration rates in soil
Coal - subtropical, high production rates OR temperate, high preservation rates.
Phosphorites - upwelling
Bauxite and Laterite - Al, Fe oxides concentrated by intense tropical weathering.
Deserts, prevaling winds
Glacial deposits

FOSSILS
terrestrial species - land bridges only
marine - could be constrained to shallow (then connectivity of shelves)
could be planktonic, distributed
could be short broadcast breeders - short distances in larval form
Extinction/replacement when continents meet - but not immediately! e.g. bering land bridge was opened during northern warm periods only.

Basically, matching is pretty imperfect, but the more factors that you can match, the more certain the correlation. never sure.

PALEOMAG

magnetic minerals in volcanic and sedimentary rocks.
Paramagnetic minerals contain odd number of electrons so one orbital is not full, this causes each atom to sense the magnetic field. In a field, the dipoles rotate parallel to the field direction. INDUCED MAGNETIZATION

FERROMAGNETIC: minerals have small domains within each crystal, where dipoles are balanced with each other as long as they're too cold for the domains to change (limit : CURIE TEMPERATURE.) Crystals must exceed a minimum size to have enough domains to have a strong internal field.

Paramagnetic: carbonates, silicates with iron. sulfides. Can have an induced field
Strongly magnetic:
Magnetite Fe_3O_4 (also known as $FeO\ Fe_2O_3$) (igneous, metamorphic, biogenic)
Hematite (diagenetic, soils/weathering)
Ilmenite: igneous, metamorphic
iron sulfides

NATURAL REMNANT MAGNETIZATION:
Primary - formed at deposition or crystallization of the rock
- -Thermoremanent: from cooling igneous rocks. Orientation of crystals and of magnetic field are locked into rock.
- - Detrital: usually magnetite, deposited in sediments. compaction can affect the orientation of the grains. Detrital grains come both from eroded igneous and metamorphic sources, as well as bacterial sources. Key process is alignment during settling. Book indicates sedimentary reworking - this is crazy talk. But in general they will have the trend but not the plunge of the field, although back calculating compaction will give an estimate of the plunge.

Secondary - formed later during deformation or metamorphism.
- - Chemical remnant magnetization: e.g. oxidation of detritus, gives a different field overprint.
- - Isothermal remnant - exposure to a strong field (e.g. lightening strike, or the instrument that measures paleomag)
- - Viscous remanent mag - long term relaxation of domains to match local weak fields

GOT THIS FAR %%%%%%

"Hard" and soft fields are hard or difficult to destroy. clean "soft" components and isolate hard by cycling/ slowly increasing strength of mag field during

measurement.

Instrument: spinning or cryogenic (superconducting) magnetometer.

ORIGINS OF FIELD: GEODYNAMO
the earth's field is produced by a region where the minerals are all above their Curie temperature! so, not a solid state phenomenon.

Incination, plunge
Declination - trend to magnetic north

inclination varies with latitude
declination varies with orientation of continent, detects rotation
NOTHING RECORDS LONGITUDE